

Claims:

1. Apparatus for electrophoretic separation of analytes, the device comprising:

5 a substrate including

(1) a central reservoir region,

(2) a plurality of electrophoretic channels in fluid communication with, and emanating substantially radially from, the central reservoir region, the channels being coplanar with each other, and each channel having (i) a proximal end which is linked to the reservoir region, and (ii) a distal end, and

(3) for each channel one or more chambers that are each linked by a passageway in fluid communication with the distal end of that channel,

15 wherein each passageway leads from each chamber in a direction that is initially away from the central reservoir region, whereby centrifugation of the substrate about a central axis that is perpendicular to the plane of the channels is effective to disperse liquid from the central reservoir region into said channels and chambers such that any air bubbles in the chambers, channels, and passageways are forced towards the axis of rotation, when such liquid is present in the central reservoir region.

25 2. The apparatus of claim 1, wherein the distal end of each channel is linked by passageways to two chambers.

30 3. The apparatus of claim 1, wherein the distal end of each channel is linked by passageways to a sample chamber, a sample-receiving chamber, and a running buffer chamber.

4. The apparatus of claim 1, which further includes electrodes for applying a voltage potential between said chambers and the central reservoir.

5 5. The apparatus of claim 1, which further includes a detector for detecting selected components which may be present in one or more of the channels.

6. The apparatus of claim 5, wherein the detector is a  
10 fluorescence or chemiluminescence detector.

7. The apparatus of claim 5, wherein the detector is rotatable about a central axis within the central reservoir region, for detecting signal emission from each of the channels  
15 at a selected distance from the axis.

8. The apparatus of claim 5, which further includes a mechanism for rotating the substrate about a central axis such that the channels pass sequentially by the detector, for  
20 detecting one or more components that may be present in the channels.

9. The apparatus of claim 1, wherein said chambers are defined in part by an annular septum that covers the chambers  
25 and permits needle-access to the chambers for delivery of liquid to the chambers.

10. The apparatus of claim 1, wherein at least one of said channels contains an electrophoresis medium.

30

11. The apparatus of claim 10, wherein the electrophoresis medium is a flowable medium.

12. The apparatus of claim 10, wherein the electrophoresis medium is a covalently crosslinked medium.

5 13. The apparatus of claim 1, wherein the substrate defines at least 20 of said channels.

14. The apparatus of claim 1, wherein said channels have cross-sectional diameters between 1 and 100  $\mu\text{m}$ .

10

15. The apparatus of claim 12, wherein said channels have cross-sectional diameters between 2 and 50  $\mu\text{m}$ .

16. A method for preparing a plurality of electrophoretic paths which are substantially bubble-free, comprising

15 providing an apparatus as defined in claim 1 such that the reservoir region either contains a liquid or is in fluid communication with a liquid source,

20 centrifuging the substrate about a central axis that is perpendicular to the channels so that the liquid is dispersed from the central reservoir region into said channels and chambers, such that any air bubbles in the chambers, channels, and/or passageways are forced towards the axis of rotation, yielding a plurality of bubble-free electrophoretic paths

25 between said reservoir and said chambers.

17. A method for preparing a plurality of electrophoretic paths which are substantially bubble-free, comprising

30 providing an apparatus as defined in claim 1 such that the reservoir region, and optionally the channels, passageways, and/or chambers contain a liquid,

centrifuging the substrate about a central axis that is perpendicular to the channels so that the liquid is dispersed from the central reservoir region into said channels and chambers, such that any air bubbles in the chambers, channels, and/or passageways are forced towards the axis of rotation, yielding a plurality of bubble-free electrophoretic paths between said reservoir and said chambers.

18. A method for analyzing a plurality of samples comprising:

providing an apparatus in accordance with claim 1, such that the central reservoir region, channels, and chambers contain a liquid medium suitable for electrophoresis of such samples,

applying an electric field under conditions effective to cause migration of sample through at least one of said channels towards the central reservoir region, and

interrogating at least one of the channel(s) to detect one or more sample components in the channel(s).

20

19. The method of claim 18, wherein the components to be detected are nucleic acids.

20. The method of claim 19, wherein the nucleic acids to be detected are fluorescently labeled.

25

21. The method of claim 19, wherein the samples are prepared by polymerase chain reaction amplification of one or more selected target sequences.

30

22. The method of claim 19, wherein the samples are prepared by ligating at least two oligonucleotides when the

oligonucleotides are bound to adjacent regions of a target polynucleotide that are complementary to the at least two oligonucleotides.

- 5        23. The method of claim 18, wherein the components to be detected are polypeptides.